Pausing During the Pandemic: Addressing Cognitive Biases in Providers' Medical Decision-Making During the COVID-19 Era

Sarah Yale, MD; Jacqueline Lee, MD; Natalya Beneschott, MD; Amanda Rogers, MD

ABSTRACT

Introduction: The COVID-19 pandemic has not only exacerbated traditional cognitive biases but also created new cognitive biases specific to the pandemic that contribute to diagnostic errors. Cases of suspected multisystem inflammatory syndrome in children (MIS-C)—one of the more clinically significant manifestations of COVID-19 in children—need to be reported and reviewed by clinicians as they have varied presentations and lack definitive confirmatory testing, presenting challenges to effective diagnosis.

Case Presentation: We present 3 cases of pediatric patients initially diagnosed with COVID-19/MIS-C who were ultimately found to have alternative diagnoses.

Discussion: For each case, we describe conventional and COVID-19-related cognitive biases to enhance awareness of their role in diagnostics and promote strategies to support diagnostic accuracy and timeliness.

Conclusion: With rapidly changing knowledge about COVID-19 and MIS-C, providers must remain diligent to counteract heuristic thinking and provide timely and accurate diagnostic evaluations.

INTRODUCTION

COVID-19 has transformed the health care field in myriad ways, one being a growing risk of cognitive biases contributing to diagnostic errors. Prior to the pandemic, diagnostic errors were estimated to occur at a rate of 10% to 15%.[1] COVID-19 has led to the rapid influx of evolving information, frequent modifications to workflows,[2] and physical and psychological strain on providers,[3] which can increase the risk of heuristic thinking.[4-6] In addition, a new typology of diagnostic errors has emerged specific to the impact of COVID-19, which clinicians must be aware of to help mitigate these barriers to optimal care.[7]

Pediatrics is uniquely vulnerable to several cognitive biases (systematic pattern of deviation from rationality in judgment) in the setting of COVID-19. There is pervasive public awareness of COVID-19 despite a relatively low severity of disease burden in pediatrics. Children often have mild cases, nonspecific findings,[8] and a high rate of asymptomatic carriage,[9] which can lead to diagnostic challenges. Additionally, multisystem inflammatory syndrome in children (MIS-C)—one of the more clinically significant manifestations of COVID-19 in children—has varied presentations and lacks definitive confirmatory testing, presenting challenges to effective diagnosis.[10]

We present 3 cases of pediatric patients initially diagnosed with COVID-19/MIS-C who were ultimately found to have alternative diagnoses. For each case, we describe conventional and COVID-19-related cognitive biases to enhance awareness of their role in diagnostics and promote strategies to support diagnostic accuracy and timeliness.

CASE 1

A 2-year-old girl presented with 2 weeks of anorexia, emesis, and abdominal discomfort. She had no fever or diarrhea. Initial evaluation included normal electrolytes, inflammatory markers, and abdominal radiograph. Her lipase was 2 to 3 times the upper limit of normal (800 U/L). Abdominal ultrasound revealed mild gallbladder wall inflammation and no pancreatic changes. Her SARS-CoV-2 nucleic acid amplification test (NAAT) was positive. She was hospitalized for dehydration suspected to be secondary to pancreatitis and COVID-19-related gastrointestinal (GI) symp-

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Author Affiliations: Children's Wisconsin, Milwaukee, Wisconsin (Yale, Rogers); Medical College of Wisconsin, Milwaukee, Wisconsin (Yale, Lee, Beneschott, Rogers).

Corresponding Author: Sarah Yale, MD, Department of Pediatrics, Medical College of Wisconsin, Children's Corporate Center, Suite 560, 999 North 92nd Street, Milwaukee, WI 53226; phone 414.337.7050; email syale@mcw.edu; ORCID ID 0000-0002-2954-4808.

toms. Subsequent review of her clinical timeline noted that her GI symptoms preceded her COVID-19 diagnosis, and additional family history noted paternal celiac disease and maternal Graves' disease. Further workup included elevated tissue transglutaminase (>128 units/mL) and positive anti-endomyoseal IgA. Her abdominal pain, anorexia, elevated lipase, and gallbladder wall inflammation were ultimately attributable to duodenitis secondary to celiac disease. She was discharged home with a celiac-appropriate diet with subsequent resolution of her symptoms.

Discussion

This case demonstrates ***confirmation bias***, when providers look for and accept only evidence that confirms a diagnostic impression, rejecting contradictory evidence.[11] Confirmation bias is closely related to availability bias, where providers tend to think of examples that come to mind more readily than the actual case frequency. Despite the patient's lack of fever, diarrhea, or respiratory symptoms, her abdominal pain and vomiting were referenced as GI manifestations of COVID-19. Similarly, despite normal pancreatic imaging, the elevated lipase and abdominal pain were attributed to acute pancreatitis. Elements supporting the suspected diagnosis were interpreted as confirmatory, while contradictory data was classified initially as an atypical presentation.

This case also highlights a specific type of error related to COVID-19 labeled as ***unintended***.[4] This is a missed or delayed diagnosis because of fewer direct provider-patient interactions, including increased use of telemedicine and personal protective equipment conservation efforts that may lead to challenges taking histories and performing exams. The patient presented early in the pandemic when infection prevention processes were in development. It is possible COVID-19-related changes in patient placement, reduced room entries, and limited experience with telehealth affected the speed at which key features were identified, including that her GI symptoms preceded her COVID-19 infection and her family history of autoimmune diseases, which were vital to reaching her ultimate diagnosis.

CASE 2

A 14-year-old female presented with 1 day of altered mental status; 3 days of fever, cough, dyspnea, vomiting, and diarrhea; 5 days of neck and throat pain; and a known COVID-19 exposure 1 month prior. She was febrile, hypotensive, and tachycardic. Blood cultures were obtained, and she was given empiric antibiotics. Workup was notable for thrombocytopenia (platelets 54 K/uL) and elevated procalcitonin (228.47 ng/mL), C-reactive protein (CRP) (23.1 mg/dL), D-dimer (4.05 mg/L), ferritin (370 ng/mL), and NT-proBNP (1,737 pg/mL). Monospot test and SARS-CoV-2 NAAT and IgG were negative. Gram stain showed gram-negative bacilli on 2 cultures. Based on her fever curve, markers of inflammation, and COVID-19 exposure, the patients was diagnosed with MIS-C and started on enoxaparin, intravenous immunoglobulin (IVIG), and steroids. After MIS-C treatment was initiated, her blood cultures subsequently grew *Fusobacterium necrophorum* and an ultrasound revealed an internal jugular vein occlusive thrombus, leading to the diagnosis of Lemierre's syndrome.

Discussion

This case represents ***diagnostic momentum,*** perpetuating a diagnostic label over time despite the label being incomplete or inaccurate, as well as premature closure where the clinician fails to consider alternative diagnoses after an initial diagnostic label is made.[11] The patient initially was labeled with MIS-C given her fevers, respiratory and GI symptoms, and degree of inflammation. This was perpetuated despite developments pointing in a different direction, including negative SARS-CoV2 NAAT and IgG testing and a positive gram stain on 2 cultures. It was not until the organism considered pathognomonic for Lemierre's syndrome was identified that the initial diagnostic label was replaced.

The case also highlights how the cognitive bias of ***anchoring*** can be amplified in the COVID-19 era. In anchoring, clinically significant non-COVID-19 diagnoses may be missed or delayed because symptoms are attributed to COVID-19. It can be challenging for clinicians to interpret new information objectively once the assumption has been made that COVID-19 is the culprit, and data are interpreted "anchored" to this original viewpoint. In this case, the 2 positive gram stains were initially assumed to be a contaminant. It was interpreted under the assumption that COVID-19 was the underlying process.

CASE 3

A 13-year-old female presented with 4 days of abdominal pain, vomiting, anorexia, dysuria, and fever. Her exam was notable for right upper quadrant tenderness and cracked lips. SARS-CoV-2 NAAT was negative, IgG was positive, and she reported a COVID-19 contact 1 month prior. Labs were notable for elevated white blood cell (WBC) count (14.6 K/uL), CRP (18.4 mg/dL), D-dimer (2.47 ug/mL), fibrinogen (982 mg/dL), and procalcitonin (2.49 ng/mL). Urinalysis showed 20-50 WBCs. Based on her fevers and labs, she initially was labeled as MIS-C and treated with IVIG. The following morning, her urine culture grew >100,000 CFU/mL of *Escherichia coli*. She was ultimately diagnosed with pyelonephritis and treated with appropriate antibiotics.

Discussion

This case demonstrates ***availability bias***,[12] the tendency to more easily recall things that were seen recently or are common or memorable. The patient presented in a timeframe of multiple MIS-C cases, which can raise the clinical suspicion and reflects a ***diagnostic recall bias***. Despite the incidence of pyelonephritis being significantly higher than MIS-C, the ubiquitous nature of information and evolving guidelines regarding MIS-C in pediatrics may lead to prematurely labeling patients with this readily available diagnosis.

The case also highlights the emerging COVID-19-related diagnostic error, ***secondary***,[7] in which a second diagnosis was initially missed due to a positive SARS-CoV-2 test. The patient's presentation initially was attributed to MIS-C, in large part due to the

Box. Diagnostic Timeout

1. Name the clinical concern or diagnostic dilemma
2. Remove diagnostic labels and instead list out signs and symptoms (ie, remove COVID-19/MIS-C)
3. Do we currently have a leading diagnosis? If so…
   - What clinical data cannot be explained with the provisional diagnosis?
   - What are the "can't miss" or "worst case scenario" diagnoses?
4. Broaden the differential using an anatomic (or age-based if pediatric patient) approach
5. Decide on next steps:
   - Obtain further history and repeat physical exam
   - Review labs and actual images (not just the reports)
   - Discuss with other team members (consultants, nurses) and family
   - Obtain further labs and imaging (using pre and posttest probability)

positive IgG, which was ultimately an incidental finding. This led to a delay in identifying the secondary clinically relevant diagnosis of pyelonephritis. This type of error may be especially prominent within pediatrics, where many COVID-19 cases are asymptomatic[9] and caught on routine surveillance testing during admission for secondary unrelated diagnoses.

MITIGATING ERROR

Providers have a crucial role in counteracting heuristic thinking and replacing it with analytical, thoughtful processing[13] in the appropriate clinical settings; yet this needs to be balanced with competing factors, such as patient acuity, efficiency, and resource management. The pandemic has highlighted that although providers are successful adapters in complex situations, these adaptations sometimes fail.

An important step in mitigating cognitive biases is increased awareness of their existence and impact on diagnostic processes. Learning about biases and actively reflecting on prior cases where biases may have been at play can be invaluable in counteracting their role in future cases. The Joint Commission recommends discussion of clinical cases that illustrate biases, such as the examples above, in order to raise awareness as to how they occur.[14]

Another simple, efficient tool to consider in addressing cognitive biases is pausing for a "diagnostic timeout." The timeout is not meant to simply create a longer differential but, instead, with diverse input from team members, can help promote analytic scrutiny and implement cognitive forcing strategies.[1] A stepwise approach to the timeout (Box) can remove diagnostic labels, review leading diagnoses, broaden differentials, and decide on next steps. Including interprofessional representation can be invaluable to ensure all perspectives are included. It is important to note that heuristic thinking is an essential part of clinician practice and that the evidence to support timeouts is limited, but it can be an valuable tool to consider in select clinical situations.

Other error mitigation strategies to consider include promoting the use of a systematic approach to common problems, acknowledgement of how the patient makes the clinician feel, and admitting one's own mistakes.[15]

CONCLUSIONS

These cases highlight how COVID-19 has further complicated the contributory role that cognitive biases play in diagnostic errors in pediatrics, exacerbating traditional cognitive biases and leading to new errors related to the pandemic. With rapidly changing knowledge and many unknowns about COVID-19/MIS-C in pediatrics, providers must remain diligent to counteract heuristic thinking and provide timely and accurate diagnostic evaluations. Open discussion of cases is an important step in raising awareness of these biases and learning from past errors. In addition, diagnostic timeouts can serve as a structured format to reflect on diagnostic reasoning and counteract future errors.

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REFERENCES

1. Berner ES, Graber ML. Overconfidence as a cause of diagnostic error in medicine. *Am J Med*. 2008;121(5 Suppl):S2-S23. doi:10.1016/j.amjmed.2008.01.001

2. Woolliscroft JO. Innovation in Response to the COVID-19 Pandemic Crisis. *Acad Med.* 2020;95(8):1140-1142. doi:10.1097/ACM.0000000000003402

3. Bradley M, Chahar P. Burnout of healthcare providers during COVID-19. *Cleve Clin J Med*. 2020;10.3949/ccjm.87a.ccc051. doi:10.3949/ccjm.87a.ccc051

4. Oliveira J E Silva L, Vidor MV, Zarpellon de Araújo V, Bellolio F. Flexibilization of science, cognitive biases, and the COVID-19 pandemic. *Mayo Clin Proc.* 2020;95(9):1842-1844. doi:10.1016/j.mayocp.2020.06.037

5. Halpern SD, Truog RD, Miller FG. Cognitive bias andpPublic health policy during the COVID-19 pandemic. *JAMA*. 2020;324(4):337-338. doi:10.1001/jama.2020.11623

6. DiMaria CN, Lee B, Fischer R, Eiger G. Cognitive Bias in the COVID-19 Pandemic. *Cureus*. 2020;12(7):e9019. doi:10.7759/cureus.9019

7. Gandhi TK, Singh H. Reducing the risk of diagnostic error in the COVID-19 era. *J Hosp Med*. 2020;15(6):363-366. doi:10.12788/jhm.3461

8. Waterfield T, Watson C, Moore R, et al. Seroprevalence of SARS-CoV-2 antibodies in children: a prospective multicentre cohort study. *Arch Dis Child*. 2021;106(7):680-686. doi:10.1136/archdischild-2020-320558

9. Zhang C, Gu J, Chen Q, et al. Clinical and epidemiological characteristics of pediatric SARS-CoV-2 infections in China: a multicenter case series. *PLoS Med.* 2020;17(6):e1003130. doi:10.1371/journal.pmed.1003130

10. Soma VL, Shust GF, Ratner AJ. Multisystem inflammatory syndrome in children. *Curr Opin Pediatr.* 2021;33(1):152-158. doi:10.1097/MOP.0000000000000974

11. Bordini BJ, Stephany A, Kliegman R. Overcoming Diagnostic Errors in Medical Practice. *J Pediatr.* 2017;185:19-25.e1. doi:10.1016/j.jpeds.2017.02.065

12. Committee on Diagnostic Error in Health Care; Board on Health Care Services; Institute of Medicine; The National Academies of Sciences, Engineering, and Medicine. The diagnostic process. In: Balogh EP, Miller BT, Ball JR, editors. *Improving Diagnosis in Health Care*. National Academies Press (US); 2015: Accessed December 12, 2020. https://www.ncbi.nlm.nih.gov/books/NBK338593/

13. Berkwitt A, Grossman M. Cognitive bias in inpatient pediatrics. *Hosp Pediatr.* 2014;4(3):190-193. doi:10.1542/hpeds.2014-0002

14. The Joint Commission, Division of Health Care Improvement. Cognitive biases in health care. *Quick Saf.* October 2016;(28): 1-3. Accessed December 15, 2020. https://www.jointcommission.org/resources/news-and-multimedia/newsletters/newsletters/quick-safety/quick-safety-28/

15. Trowbridge RL. Twelve tips for teaching avoidance of diagnostic errors. *Med Teach.* 2008;30(5):496-500. doi:10.1080/01421590801965137

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